PATENT ABSTRACTS OF JAPAN

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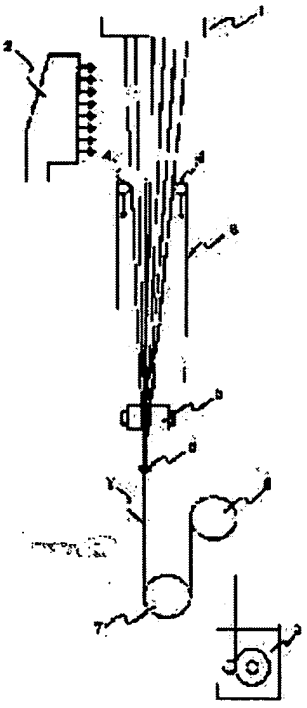
(71)Applicant : UNITIKA LTD
(72)Inventor : OKUBO MUNEMASA
OKU MASAKI
IZUMIMOTO NOBUHIRO

(54) COOLING OF MELT-SPUN FIBER

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a method for cooling melt spun fiber, capable of carrying out uniform cooling free from dispersion of solidifying point and providing a fiber free from unevenness of physical properties and winding as package having good wound shape in winding by cooling melt spun fiber in a cooling cylinder in which stable stream is formed.
SOLUTION: In a method for melt-spinning a thermoplastic polymer from a spinneret 1, cooling the resultant yarn by a cooling air-blowing device 2, successively traveling the yarn through a cooling cylinder 3 and taking the yarn off by a taking-off roller 7, a descending stream is formed in traveling direction of yarn in the cooling cylinder 3 and the yarn having ≥50 denier single yarn fineness after taking off by the taking roller 7 is traveled through the interior of the cooling cylinder to cool the yarn.



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(71)出願人　000004503
ユニチカ株式会社
兵庫県尼崎市東本町１丁目50番地

(72)発明者　大久保　宗政
京都府宇治市宇治戸ノ内５　ユニチカ株式会社宇治工場内

(72)発明者　奥　正樹
京都府宇治市宇治戸ノ内５　ユニチカ株式会社宇治工場内

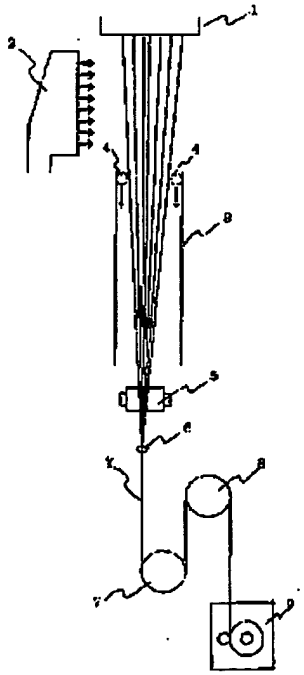
(72)発明者　泉本　信博
京都府宇治市宇治戸ノ内５　ユニチカ株式会社宇治工場内

(54)【発明の名称】　溶融紡糸繊維の冷却方法

(57)【要約】

【課題】　安定した気流が形成された冷却筒内で冷却されることによって、固化点のばらつきのない均一な冷却が行え、物性斑のない繊維を得ることができ、巻取時には良好な巻き姿のパッケージに巻き取ることができる溶融紡糸繊維の冷却方法を提供する。

【解決手段】　熱可塑性重合体を紡糸口金１より溶融紡糸し、糸条を冷却風吹き付け装置２で冷却し、続いて冷却筒３内を走行させて冷却した後、引取ローラ７で引き取る方法において、冷却筒３内に糸条の走行方向に沿って下降気流を形成させ、この冷却筒３内を、引取ローラ７での引き取り後の単糸繊度が５０デニール以上となる糸条を走行させて冷却する、溶融紡糸繊維の冷却方法。



1

【特許請求の範囲】

【請求項1】　熱可塑性重合体を紡糸口金より溶融紡糸し、糸条を冷却風吹き付け装置で冷却し、続いて冷却筒内を走行させて冷却した後、引取ローラで引き取る方法において、冷却筒内に糸条の走行方向に沿って下降気流を形成させ、この冷却筒内を、引取ローラでの引き取り後の単糸繊度が50デニール以上となる糸条を走行させて冷却することを特徴とする溶融紡糸繊維の冷却方法。

【請求項2】　熱可塑性重合体を紡糸口金より溶融紡糸し、糸条を冷却風吹き付け装置で冷却し、続いて冷却筒内を走行させて冷却した後、引取ローラで引き取る方法において、冷却筒内に内壁に沿って下降気流を吹き付けるパイプを周設し、かつこのパイプより内側に内壁に沿って筒状のカバーを冷却筒内の一部に設け、このカバー内を引取ローラでの引き取り後の単糸繊度が50デニール以上となる糸条を走行させて冷却することを特徴とする溶融紡糸繊維の冷却方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、均一な冷却を行うことにより、物性斑のないポリアミド、ポリエステル等の合成繊維を得ることができる溶融紡糸繊維の冷却方法に関するものである。

【0002】

【従来の技術】熱可塑性重合体を溶融し、ポリアミド、ポリエステル等の合成繊維を一工程法で製造する方法においては、紡糸口金より紡糸した糸条を冷却風吹き付け装置で冷却し、続いて冷却筒内で冷却した後、引き取るか、又は引き続いて延伸を行い、巻き取る。単糸繊度の大きい銘柄の糸条の場合、溶融紡糸後、冷却風吹き付け装置で冷却された糸条は完全に固化されておらず、冷却筒内を走行するうちに固化するため、冷却筒の気流の状態が糸条の固化点の位置や固化の状態を左右する要因となっている。冷却筒は通常2～5m程度のものであり、気圧差により筒内の気流は乱れやすく、この気流の乱れによって、糸条の固化点の位置にばらつきが生じ、均一な冷却が阻害され、物性斑が生じる。

【0003】単糸繊度の小さい銘柄の糸条を溶融紡糸する際には、糸条の表面積が大きくなるため、引き取られる方向、下向きの随伴気流が多くなり、これによって、冷却筒内で安定した下降気流が形成され、筒内の気流の乱れが生じることが少なくなり、均一な冷却が行われ、斑のない糸条が得られやすい。

【0004】一方、単糸繊度の大きい銘柄の糸条を溶融紡糸する際には、糸条の表面積が小さくなるため、下向きの随伴気流は少なく、冷却筒内で安定した気流が形成されない。したがって、固化する前の糸条は、気圧差による冷却筒内の気流の乱れの影響を受けやすく、しかも、単糸繊度が大きいため、固化までに時間がかかり、気流の乱れの影響を大きく受けることとなり、その結果、糸条の固化点の位置がばらつき、均一な冷却が阻害され、物性斑の生じた糸条となるという問題があった。さらに、このように物性斑が生じた糸条を巻き取ると、糸切れ、渡り糸や面落ちが生じ、巻き姿の悪いパッケージとなるという問題があった。

2

【0005】

【発明が解決しようとする課題】本発明は、上記のような問題点を解決し、単糸繊度の大きい銘柄の糸条を安定した気流が形成された冷却筒内で冷却することによって、固化点のばらつきのない均一な冷却が行え、物性斑のない糸条を得ることができ、巻取時には良好な巻き姿のパッケージに巻き取ることができる溶融紡糸繊維の冷却方法を提供することを技術的な課題とするものである。

【0006】

【課題を解決するための手段】本発明者らは、上記の課題を解決するために鋭意研究した結果、本発明に到達した。すなわち、第一発明は、熱可塑性重合体を紡糸口金より溶融紡糸し、糸条を冷却風吹き付け装置で冷却し、続いて冷却筒内を走行させて冷却した後、引取ローラで引き取る方法において、冷却筒内に糸条の走行方向に沿って下降気流を形成させ、この冷却筒内を、引取ローラでの引き取り後の単糸繊度が50デニール以上となる糸条を走行させて冷却することを特徴とする溶融紡糸繊維の冷却方法を要旨とするものである。第二発明は、熱可塑性重合体を紡糸口金より溶融紡糸し、糸条を冷却風吹き付け装置で冷却し、続いて冷却筒内を走行させて冷却した後、引取ローラで引き取る方法において、冷却筒内に内壁に沿って下降気流を吹き付けるパイプを周設し、かつこのパイプより内側に内壁に沿って筒状のカバーを冷却筒内の一部に設け、このカバー内を引取ローラでの引き取り後の単糸繊度が50デニール以上となる糸条を走行させて冷却することを特徴とする溶融紡糸繊維の冷却方法を要旨とするものである。

【0007】

【発明の実施の形態】次に、本発明を図面を用いて詳細に説明する。図1は、本発明の溶融紡糸繊維の冷却方法の一実施態様を示す概略工程図である。図2は、第一発明に使用する冷却筒内部（気流の状態も）の一実施態様を示す説明図であり、図3は、第二発明に使用する冷却筒内部（気流の状態も）の一実施態様を示す説明図であり、図4は、図3の冷却筒の上面図である。

【0008】まず、本発明において溶融紡糸される熱可塑性重合体としては、ナイロン6、66等のポリアミド、ポリエチレンテレフタレート等のポリエステルが挙げられ、また、これらの共重合体でもよい。

【0009】本発明は、これらの熱可塑性重合体を溶融し、紡糸口金1より紡糸した糸条Yに、まず冷却風吹き付け装置2で冷却風を吹き付け、続いて冷却筒3内を走行させることによって冷却した後、引き取る方法に関す

るものである。冷却筒３内で完全に固化された糸条Ｙは、油剤付与装置５で油剤を付与され、集束装置６で集束された後、引取ローラ７、８で引き取られ、巻取装置９で巻き取られる。

【００１０】なお、冷却風吹き付け装置２としては、図１に示すような片側吹き付けのものでも、環状に吹き付けるものでもよい。そして、本発明においては、このような冷却風吹き付け装置で冷却を行った後、まだ完全に固化していない糸条を、糸条の走行方向に沿って安定した気流が形成された冷却筒内を走行させて、冷却、固化することが必要である。

【００１１】第一発明は、冷却筒内に糸条の走行方向に沿って下降気流を形成させ、この冷却筒内を糸条を走行させて冷却するものである。冷却筒内に下降気流を形成させる手段としては、冷却筒内に一定かつ均一の下降気流を形成するものであれば、冷却筒内の上部より冷却風を吹き付けるものでも冷却筒の下部より空気を吸引するものでもよいが、図４に示すように、冷却筒３の上部に、内壁に沿ってパイプ４を周設し、パイプ４に均等に設けた複数の穴11より圧縮された空気が糸条の走行方向に沿って吹き出すものが好ましい。

【００１２】このように、冷却筒の内壁に沿って、上部より下降気流を糸条の走行方向に吹き出させたり、下部より空気を吸引して下降気流を形成させることによって、冷却筒内の気圧の差により発生する気流の乱れに打ち勝つ、安定した気流が形成される。したがって、糸条は、安定した下降気流が形成された冷却筒内を走行しながら冷却されるので、冷却筒の気流が乱れやすい単糸繊度の大きい銘柄の糸条の場合でも、糸条の固化点の位置がばらつくことなく、均一な冷却が行え、斑のない糸条を得ることができる。

【００１３】第二発明は、図３、４に示すように、冷却筒の上部に、内壁に沿って下降気流を吹き出すパイプ４を周設し、冷却筒の上方で、かつこのパイプより内側に内壁に沿って筒状のカバー10を冷却筒の一部に設け、このカバー内を、引取ローラ７での引き取り後の単糸繊度が50デニール以上となる糸条を走行させて冷却するものである。

【００１４】このように冷却筒内に筒状のカバーを設けると、パイプより吹き出される下降気流は、カバーと冷却筒の間を通る。そして、カバーの下端より下方のカバーの設置されていない冷却筒内においては、カバーと冷却筒の間を通ってきた下降気流が冷却筒内全体に流れ出し、筒内全体に下降気流が形成される。一方、カバー内では、下降気流が吹き出されていないが、カバーと冷却筒の間を通ってきた下降気流がカバーの下端から冷却筒内全体に吹き出されると、気圧差により吹き出された空気の一部がカバー内に吸い込まれ、上昇気流が形成される。

【００１５】この上昇気流によりカバー内の気流は安定するので、筒内に安定した下降気流が形成される第一発明と同様に、安定した上昇気流が形成されたカバー内を糸条が走行し、この間に固化されることによって、均一な冷却が行え、固化点のばらつきが生じることがない。

【００１６】したがって、冷却筒内に設ける筒状のカバー内に、走行する糸条の固化点が存在するように、カバーの長さを選択することが必要である。カバーの長さは、糸条の単糸繊度やフィラメント数等により適宜変更すればよいが、おおむね冷却筒の長さの１／２～１／３の長さとすることが好ましい。

【００１７】冷却筒のカバー内では、形成される上昇気流が糸条の走行方向と逆向きであることによって、糸条の冷却効率が高まり、また、カバーのない冷却筒内では下降気流が形成されているため、筒内で空気抵抗による空気延伸が行われて、引き取り時の張力が高まり、引取ローラ上の糸条の揺れが減少し、糸条の物性をより均一にする役目を果たしていると思われる。また、冷却筒のカバー内では上昇気流、カバーのない部分では下降気流が形成されているが、糸条はカバー内で完全に固化するため、カバーの下端付近で多少生じる気流の乱れの影響を受けることはない。

【００１８】また、カバーを設置するには、上端に引っ掛け具を設け、冷却筒の上端に引っ掛けて設置すればよい。カバーの材質は特に限定されるものではなく、亜鉛板、ステンレス鋼板や塩化ビニル樹脂等が挙げられる。

【００１９】冷却筒内の上部から糸条の走行方向に沿って吹き出す下降気流の速度や量については、前記のような効果を奏することができるように、単糸繊度やフィラメント数によって、適宜選択すればよい。

【００２０】第一、第二発明ともに、引き取り後、引き続いて延伸し、高速（3000m／分程度）で巻き取る高速紡糸法でもよいが、低速（500 ～1000m／分程度）で引き取り、引き続いて延伸するスピンドロー法を採用することが好ましい。

【００２１】本発明において、冷却筒内を走行させて冷却する糸条は、引取ローラでの引き取り後の単糸繊度が50デニール以上となる単糸繊度の大きい銘柄の糸条であるが、図１に示すように引取ローラが２つ以上ある場合は、１つめの引取ローラ７で引き取られた糸条の単糸繊度をいう。そして、上記のように引き取り後に引き続いて延伸する場合は、２つ目以降の引取ローラ８間で延伸を施す。そして、引き取り後の単糸繊度は、好ましくは50～400 デニール、さらに好ましくは50～150 デニールであって、延伸後の単糸繊度は、10～70デニール程度のものとすることが好ましく、フィラメント数は20～100程度のものが好ましい。

【００２２】

【実施例】次に、本発明を実施例により具体的に説明する。なお、実施例における評価は次の方法で行った。

（１）強度、伸度のばらつき

5

JIS L-1013 7 5 1法に準じ、島津社製定速伸長型試験機を用いて引っ張り試験を行った。つかみ間隔は25cm．引っ張り速度は30cmであり．試料が切断したときの荷重SD（gf）と伸びE（cm）を測＊

6

＊定した。測定は10m間隔で100回行い．次式により強度．伸度を算出し，標準偏差によりばらつきを評価した。

強度（gf／d）＝SD／d　d：試料の正量繊度

伸度（%）＝E／L×100　L：つかみ間隔（25cm）

（2）巻き姿（満巻率　%）

巻き上がった7kgのパッケージを目視で判定し．次の4段階で評価した。

◎：極めて良好

○：良好

△：面落ちはないが、バルジあり

×：面落ち、バルジともにあり

（3）糸切れ

72時間連続して紡糸を行い．その間の糸切れ回数をカウントした。

【0023】実施例1

相対粘度（96%硫酸を溶媒とし、濃度1g／dl．温度25℃で測定した。）3.50のナイロン6チップを用い．溶融温度270℃とし．孔径0.70mm、孔数28の口金を用いて溶融紡糸した。図1に示す工程に従い．紡糸した糸条を加熱フードを通過させ、片側吹き付けの冷却風吹き付け装置で冷却した後、続いて．冷却風吹き付け装置の直下に設けた冷却筒（3.5m）内を走行させて冷却を行った。このとき．冷却筒には図4に示すように、冷却筒の上部に、内壁に沿って空気を吹き出すパイプを周設し、冷却筒内に下降気流を形成した。続いて、スピンドロー法により、引取ローラ7で引き取り．引き続いて引取ローラ7，8間で延伸し、3000m／分の速度の巻取装置9で巻き取った。糸条は、引取ローラ7での引き取り後の単糸繊度が128dであり．最終的に得られた糸条は840※d／28fのものであった。このとき．得られた糸条の物性及び巻き姿．糸切れ回数の評価を表1に示す。

【0024】実施例2～3

紡糸口金の孔数や吐出量等を変更し．糸条の引取ローラでの引き取り後の単糸繊度及び最終的に得られた糸条の繊度を表1に示すような値のものとなるようにした以外は．実施例1と同様に行った。このとき、得られた糸条の物性及び巻き姿、糸切れ回数の評価を表1に示す。

【0025】比較例1～3

冷却筒上部のパイプから空気を吹き出さず、冷却筒内に下降気流を形成せずに、糸条の引取ローラでの引き取り後の単糸繊度及び最終的に得られた糸条の繊度を表1に示すような値のものとなるようにした以外は、実施例1と同様に行った。このとき．得られた糸条の物性及び巻き姿．糸切れ回数の評価を表1に示す。

【0026】実施例4

冷却筒内の上部に、内壁に沿ってパイプを周設し．このパイプより下降気流を吹き付け、かつこのパイプより内側に内壁に沿って筒状のカバーを設け．カバー内を糸条を走行させて冷却を行った以外は実施例1と同様に行った。カバーは亜鉛板製であり、長さは1.5mのものであった。このとき．得られた糸条の物性及び巻き姿．糸切れ回数の評価を表1に示す。

【0027】

【表1】

		引取時の単糸繊度 d	巻取時の繊度 d／f	ばらつき 強度	ばらつき 伸度	パッケージ巻姿	糸切れ回数
実施例	1	128	840/28	0.974	1.250	○	0
	2	51	840/70	0.048	0.836	◎	0
	3	125	1260/42	0.080	1.113	○	0
	4	120	840/28	0.030	0.538	◎	0
比較例	1	137	840/28	0.192	1.432	×	8
	2	54	840/70	0.084	1.297	△	0
	3	134	1260/42	0.163	1.502	×	11

【0028】表1より明らかなように．実施例1～4では．糸切れの発生もなく．得られた糸条は、物性斑もなく．パッケージに巻き取られた巻き姿の評価も高いものであった。一方．比較例1～3は、冷却筒内に安定した気流が形成されなかったため、比較例1，3は糸切れ発生回数が多く．パッケージの巻き姿も悪く、得られた繊維は物性斑の生じたものであった。比較例2は．得られた繊維の物性斑は比較的少なかったが．巻き取られたパッケージはバルジが生じており、巻き姿の悪いものであった。

【0029】

【発明の効果】本発明の冷却方法によれば、糸条を安定

した気流が形成された冷却筒内で冷却．固化することによって、均一な冷却が行え．冷却時の糸条の固化点のばらつきがなく．物性斑のない糸条を得ることができ、さらに．良好な巻き姿のパッケージに巻き取ることが可能となる。

【図面の簡単な説明】

【図１】本発明の溶融紡糸繊維の冷却方法の一実施態様を示す概略工程図である。

【図２】第一発明に使用する冷却筒内部（気流の状態も）の一実施態様を示す説明図である。

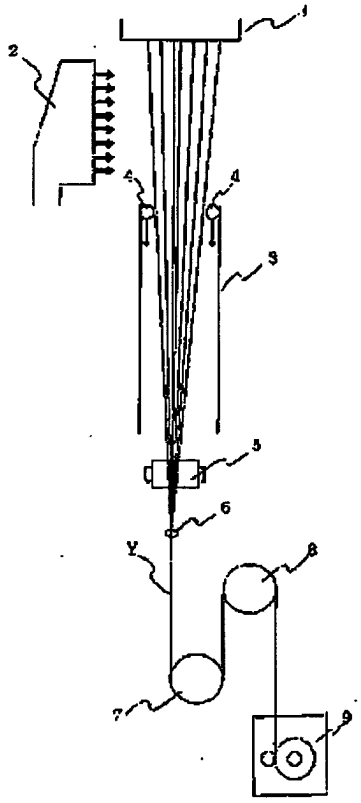
【図３】第二発明に使用する冷却筒内部（気流の状態も）の一実施態様を示す説明図である。

＊【図４】図３の冷却筒の上面図である。

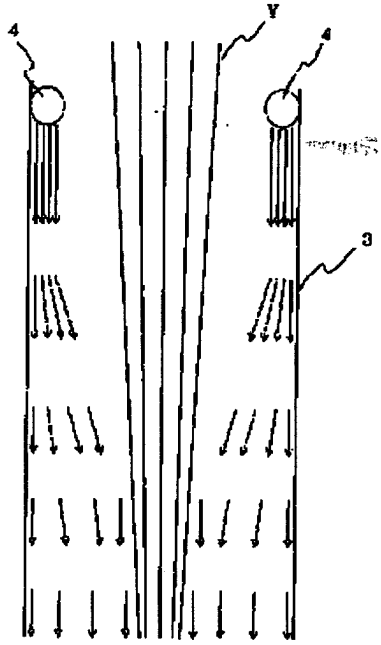
【符号の説明】

1　紡糸口金
2　冷却風吹き付け装置
3　冷却筒
4　パイプ
5　油剤付与装置
6　集束装置
7．8　引取ローラ
9　巻取装置
10　カバー
Y　糸条

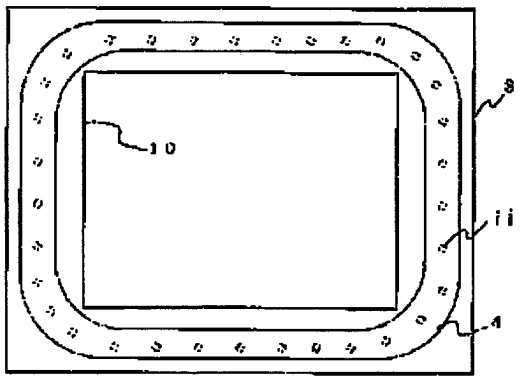
【図１】



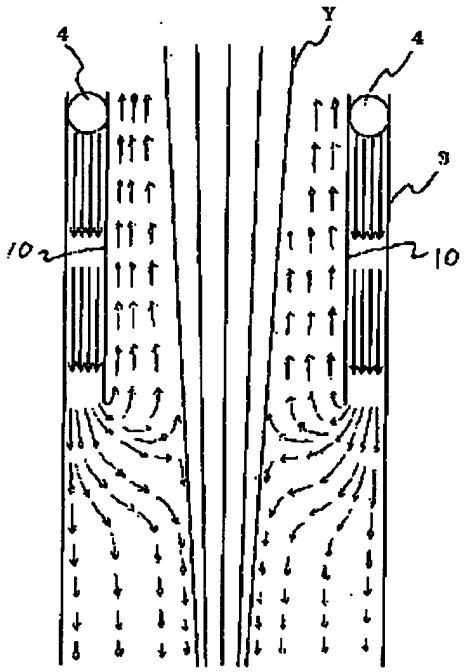
【図２】



【図４】



【図3】



rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Machine Translation of JP 11-61550

CLAIMS

[Claim(s)]
[Claim 1] The cooling approach of the melt-spinning fiber which carries out melt spinning of the thermoplastic polymer from a spinneret, cools a line of thread with the blasting equipment of the cooling style, and is characterized by to make a descending current form along the transit direction of a line of thread in a cooling dome, to make it run the line of thread from which the single-yarn fineness after the taking over by the taking-over roller becomes 50 deniers or more about the inside of this cooling dome, and to cool in the approach of taking over with a taking-over roller after making it run in a cooling dome continuously and cooling.
[Claim 2] In the approach of carrying out melt spinning of the thermoplastic polymer from a spinneret, and cooling a line of thread with the blasting equipment of the cooling style, and taking over with a taking over roller, after making it run in a cooling dome continuously and cooling Attach the pipe which sprays a down draft in accordance with a wall in a cooling dome, and tubed covering is prepared in accordance with a wall at the part in a cooling dome inside the pipe of a parenthesis. The cooling approach of the melt spinning fiber characterized by making it run the line of thread from which the single-yarn fineness after the taking over by the taking over roller becomes 50 deniers or more about the inside of this covering, and cooling.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the cooling approach of melt spinning fiber that synthetic fibers without physical-properties spots, such as a polyamide and polyester, can be obtained, by performing uniform cooling.
[0002]
[Description of the Prior Art] A thermoplastic polymer is fused and the line of thread which carried out spinning from the spinneret in the approach of manufacturing synthetic fibers, such as a polyamide and polyester, by the 1 process method is cooled with the blasting equipment of the cooling style, and after cooling within a cooling dome continuously, it takes over, or it extends succeedingly and rolls round. It is not solidified completely, but the line of thread which was cooled with the blasting equipment of the cooling style after melt spinning in the case of the line

of thread of a brand with large single-yarn fineness is the factor in which the condition of the air current of a cooling dome influences the location of the solidifying point of a line of thread, and the condition of solidification, in order to solidify, while running in a cooling dome. A cooling dome is usually an about [2-5m] thing, dispersion produces the air current in a cylinder in the location of the solidifying point of a line of thread by turbulence or turbulence of this air current which becomes empty, uniform cooling is checked by the atmospheric-pressure difference and physical-properties spots arise according to it.

[0003] The down draft stabilized within the cooling dome by this is formed, that turbulence of the air current in a cylinder arises decreases, uniform cooling is performed [the direction and the downward company air current which are taken over since the surface area of a line of thread becomes large in case melt spinning of the line of thread of a brand with small single-yarn fineness is carried out increase,], and a line of thread without spots is easy to be obtained.

[0004] Since the surface area of a line of thread becomes small on the other hand in case melt spinning of the line of thread of a brand with large single-yarn fineness is carried out, there are few downward company air currents and the air current stabilized within the cooling dome is not formed. Therefore, by being easy to be influenced of turbulence by the air current in the cooling dome by the atmospheric-pressure difference, since single-yarn fineness is moreover large, time amount will be taken by solidification, and it will be greatly influenced by the air current of turbulence, consequently dispersion and uniform cooling were checked for the location of the solidifying point of a line of thread, and the line of thread before solidifying had the problem of becoming the line of thread which physical-properties spots produced. Furthermore, when the line of thread which physical-properties spots produced in this way was rolled round, the thread breakage, passage yarn, and field omission arose, and there was a problem of becoming the bad package of a volume figure.

[0005]

[Problem(s) to be Solved by the Invention] By solving the above troubles and cooling the line of thread of a brand with large single yarn fineness within the cooling dome in which the stable air current be formed , this invention can perform uniform cooling without dispersion in a solidifying point , can obtain a line of thread without physical properties spots , and make it a technical technical problem to offer the cooling approach of the melt spinning fiber which can be roll round in the package of a good volume figure at the time of winding .

[0006]

[Means for Solving the Problem] this invention persons reached this invention, as a result of inquiring wholeheartedly, in order to solve the above-mentioned technical problem. Namely, the first invention carries out melt spinning of the thermoplastic polymer from a spinneret, cools a line of thread with the blasting equipment of the cooling style, and after making it run in a cooling dome continuously and cooling, it sets it to the approach of taking over with a taking over roller. A descending current is made to form along the transit direction of a line of thread in a cooling dome, and let the cooling approach of the melt spinning fiber characterized by making it run the line of thread from which the single-yarn fineness after the taking over by the taking over roller becomes 50 deniers or more about the inside of this cooling dome, and cooling be a summary. In the approach of the second invention carrying out melt spinning of the thermoplastic polymer from a spinneret, and cooling a line of thread with the blasting equipment of the cooling style, and taking over with a taking over roller, after making it run in a cooling dome continuously and cooling Attach the pipe which sprays a down draft in accordance with a wall in

a cooling dome, and tubed covering is prepared in accordance with a wall at the part in a cooling dome inside the pipe of a parenthesis. Let the cooling approach of the melt spinning fiber characterized by making it run the line of thread from which the single-yarn fineness after the taking over by the taking over roller becomes 50 deniers or more about the inside of this covering, and cooling be a summary.

[0007]

[Embodiment of the Invention] Next, this invention is explained to a detail using a drawing. Drawing 1 is outline process drawing showing one embodiment of the cooling approach of the melt spinning fiber of this invention. Drawing 2 is the explanatory view showing 1 inside the cooling dome used for the first invention (also condition of an air current) embodiment, drawing 3 is the explanatory view showing 1 inside the cooling dome used for the second invention (also condition of an air current) embodiment, and drawing 4 is the plan of the cooling dome of drawing 3 .

[0008] First, as a thermoplastic polymer by which melt spinning is carried out in this invention, polyester, such as a polyamide of nylon 6 and 66 grades and polyethylene terephthalate, may be mentioned, and these copolymers are sufficient.

[0009] This invention fuses these thermoplastic polymers, and after cooling by making it spray a cooling wind and run in a cooling dome 3 to the line of thread Y which carried out spinning from the spinneret 1 continuously with the blasting equipment 2 of the cooling style first, it relates to the approach of taking over. After oils are given to the line of thread Y completely solidified within the cooling dome 3 by oils grant equipment 5 and it converges with a focusing arrangement 6, it is taken over by the taking over rollers 7 and 8, and is rolled round with take-up motion 9.

[0010] In addition, as blasting equipment 2 of the cooling style, the thing of single-sided blasting as shown in drawing 1 may also be sprayed annularly. And in this invention, after cooling with such blasting equipment of the cooling style, it is required to make it run in the cooling dome in which the air current stabilized along the transit direction of a line of thread in the line of thread which has not been solidified completely yet was formed, and to cool and solidify.

[0011] The first invention makes a down draft form along the transit direction of a line of thread in a cooling dome, makes it run a line of thread, and cools the inside of this cooling dome. As a means to make a down draft form in a cooling dome As long as it forms the down draft of homogeneity, fixed in a cooling dome and the thing to which what sprays a cooling wind from the upper part in a cooling dome attracts air from the lower part of a cooling dome may be used, but as shown in drawing 4 That from which the air compressed from two or more holes 11 which attached the pipe 4 around the upper part of a cooling dome 3 in accordance with the wall, and were equally established in it at the pipe 4 blows off along the transit direction of a line of thread is desirable.

[0012] Thus, the stable air current which overcomes turbulence of the air current generated according to the difference of the atmospheric pressure in a cooling dome is formed by making a down draft blow off from the upper part in the transit direction of a line of thread, or attracting air and making a down draft form from the lower part in accordance with the wall of a cooling dome. Therefore, since a line of thread is cooled running in the cooling dome in which the stable down draft was formed, without the location of the solidifying point of a line of thread differing also in the case of the large line of thread of a brand of turbulence or cone single-yarn fineness, uniform cooling can be performed and the air current of a cooling dome can obtain a line of

thread without spots.
[0013] As shown in drawing 3 and 4, the second invention attaches around the upper part of a cooling dome the pipe 4 which blows off a down draft in accordance with a wall, it is the upper part of a cooling dome, and it forms the tubed covering 10 in accordance with a wall at a part of cooling dome inside the pipe of a parenthesis, makes it run the line of thread from which the single-yarn fineness after the taking over by the taking over roller 7 becomes 50 deniers or more about the inside of this covering, and is cooled.
[0014] Thus, when tubed covering is prepared in a cooling dome, the descending current which blows off from a pipe passes along between covering and cooling domes. And the down draft which has passed along between covering and cooling domes from the lower limit of covering in the cooling dome in which downward covering is not installed is formed in [whole] a cooling dome, and a down draft is formed in [whole] outflow and a cylinder. On the other hand, within covering, although the descending current is not blowing off, if the descending current passing through between covering and cooling domes blows off from the lower limit of covering in [whole] a cooling dome, a part of air which blew off according to the atmospheric-pressure difference will be inhaled in covering, and an ascending air current will be formed.
[0015] By a line's of thread running in covering with which the stable ascending current was formed like [since the air current in covering is stabilized by this ascending current] the first invention in which the descending current stabilized in the cylinder is formed, and being solidified in the meantime, uniform cooling can be performed and dispersion in a solidifying point does not arise.
[0016] Therefore, in tubed covering prepared in a cooling dome, it is required to choose the die length of covering so that the solidifying point of the line of thread it runs may exist. Although what is necessary is just to change the die length of covering suitably with single-yarn fineness, the number of filaments, etc. of a line of thread, it is desirable to consider as the die length of 1 / 2 - 1/3 of the die length of a cooling dome in general.
[0017] Within the cooling dome which the cooling effectiveness of a line of thread increases, and does not have covering when the ascending air current formed is the transit direction and reverse sense of a line of thread within covering of a cooling dome, since the down draft is formed, air extension by air resistance is performed within a cylinder, the tension at the time of taking over increases, the shake of the line of thread on a taking over roller decreases, and it is thought that the duty which makes the physical properties of a line of thread homogeneity more has been achieved. Moreover, within covering of a cooling dome, although the descending current is formed in the ascending current and the part without covering, a line of thread is not influenced by the air current somewhat produced near the lower limit of covering of turbulence, in order to solidify completely within covering.
[0018] Moreover, what is necessary is to hook on upper limit, to prepare an ingredient, to hook on the upper limit of a cooling dome, and just to install, in order to install covering. Especially the quality of the material of covering is not limited, and a zinc plate, a stainless steel plate, vinyl chloride resin, etc. are mentioned.
[0019] What is necessary is just to choose suitably with single-yarn fineness or the number of filaments about the rate and amount of a down draft which blow off from the upper part in a cooling dome along the transit direction of a line of thread, so that the above effectiveness can be done so.
[0020] Although the high-speed spinning method which extends the second invention

succeedingly and rolls it round after taking over at high speed (about 3000m/(minute)) may be used for a start, it is desirable to adopt the spin draw method which takes over at a low speed (about 500-1000m/(minute)), and is extended succeedingly.

[0021] In this invention, although the line of thread which is run in a cooling dome and cooled is a line of thread of the brand with large single-yarn fineness with which the single-yarn fineness after the taking over by the taking over roller becomes 50 deniers or more, as shown in drawing 1 , the single-yarn fineness of the line of thread by which two or more taking over rollers were taken over with the 1st taking over roller 7 in a certain case is said. And when extending following the taking over back as mentioned above, it extends between the taking over rollers 8 after the 2nd. And the single-yarn fineness after taking over is 50-400 preferably. It is 50-150 preferably to a denier and a pan. It is a denier, as for the single-yarn fineness after extension, it is desirable to consider as an about 10-70-denier thing, and the number of filaments is 20-100. The thing of extent is desirable.

[0022]

[Example] Next, an example explains this invention concretely. In addition, evaluation in an example was performed by the following approach.

(1) Dispersion JIS of reinforcement and ductility L-1013 7 5 According to one law, it examined by pulling using the Shimazu constant-rate-of-extension mold testing machine. Grip spacing is 25cm, a hauling rate is 30cm, and the load SD (gf) when a sample cuts, and elongation E (cm) were measured. Measurement is 100 at intervals of 10m. Reinforcement and ductility are computed by a time deed and the degree type, Standard deviation estimated dispersion.

Reinforcement (gf/d) = SD/d d: Conditioned-weight fineness of a sample Ductility (%) =ELx100 L: Grip spacing (25cm)

(2) Volume figure (****** %)

The rolled 7kg package was judged visually and it evaluated in the following four steps.

O : although there was no fitness O:fitness **:side omission extremely, x:side omission with a blister and a blister performed spinning continuously for **** (3) thread-breakage 72 hours, and counted the count of the thread breakage in the meantime.

[0023] the nylon 6 chip of example plane 1 pair viscosity (the sulfuric acid was used as the solvent 96%, and it measured at concentration 1 g/dl and the temperature of 25 degrees C.) 3.50 -- using -- melting temperature 270 ** -- carrying out -- 0.70mm of apertures, and a hole -- melt spinning was carried out using the mouthpiece of a-28 number. After passing the heating hood and cooling the line of thread which carried out spinning with the blasting equipment of the cooling style of single-sided blasting according to the process shown in drawing 1 , it cooled by making it run in the cooling dome (3.5 m) prepared directly under the blasting equipment of the cooling style. At this time, as shown in a cooling dome at drawing 4 , the pipe which blows off air in accordance with a wall in the upper part of a cooling dome was attached, and the down draft was formed in the cooling dome. Then, by the spin draw method, the taking over roller 7 took over, and it extended between the taking over roller 7 and 8 succeedingly, and rolled round with the take-up motion 9 of 3000m rate for /. A line of thread is a line of thread which the single-yarn fineness after the taking over by the taking over roller 7 is 128 d, and was finally obtained. It was a 840d/f [28] thing. At this time, evaluation of the physical properties of the obtained line of thread and a volume figure, and the count of the thread breakage is shown in Table 1.

[0024] The number of holes, discharge quantity, etc. of two to example 3 spinneret were

changed, and it carried out like the example 1 except having made it become the thing of a value as shows the single-yarn fineness after the taking over by the taking over roller of a line of thread, and the fineness of a line of thread finally obtained in Table 1. At this time, evaluation of the physical properties of the obtained line of thread and a volume figure, and the count of the thread breakage is shown in Table 1.

[0025] Air was not blown off from the pipe of the example 1 of a comparison - 3 cooling-dome upper part, but it carried out like the example 1 except having made it become the thing of a value as shows the single-yarn fineness after the taking over by the taking over roller of a line of thread, and the fineness of a line of thread finally obtained in Table 1, without forming a down draft in a cooling dome. At this time, evaluation of the physical properties of the obtained line of thread and a volume figure, and the count of the thread breakage is shown in Table 1.

[0026] The pipe was attached around the upper part in example 4 cooling dome in accordance with the wall, and it carried out like [spray a descending current from this pipe, prepare tubed covering in accordance with a wall inside the pipe of a parenthesis, and] the example 1 except having cooled the inside of covering by making it run a line of thread. Covering was a product made from a zinc plate, and die length was the thing of 1.5 m. At this time, evaluation of the physical properties of the obtained line of thread and a volume figure, and the count of the thread breakage is shown in Table 1.

[0027]

[Table 1]

[0028] The evaluation of the volume figure which physical-properties spots do not have, either and was rolled round by the package of the line of thread which generating of the thread breakage does not have, either and was obtained in the examples 1-4 was also high so that more clearly than Table 1. the fiber which the examples 1 and 3 of a comparison had many counts of thread-breakage generating, that of the volume figure of a package were bad, and was obtained on the other hand since the air current stabilized in the cooling dome by the examples 1-3 of a comparison was not formed -- physical-properties spots -- having been generated . The blister had arisen and the example 2 of a comparison of the volume figure was [the rolled-round package] bad, although there were comparatively few physical-properties spots of the obtained fiber.

[0029]

[Effect of the Invention] By cooling and solidifying within the cooling dome in which the air current stabilized in the line of thread was formed according to the cooling approach of this invention, the line of thread which can perform uniform cooling, does not have dispersion in the solidifying point of the line of thread at the time of cooling, and does not have physical-properties spots can be obtained, and it becomes possible to roll round in the package of a still better volume figure.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is outline process drawing showing one embodiment of the cooling approach of the melt spinning fiber of this invention.
[Drawing 2] It is the explanatory view showing 1 inside the cooling dome used for the first invention (also condition of an air current) embodiment.
[Drawing 3] It is the explanatory view showing 1 inside the cooling dome used for the second invention (also condition of an air current) embodiment.
[Drawing 4] It is the plan of the cooling dome of drawing 3 .
[Description of Notations]
1 Spinneret
2 Blasting Equipment of the Cooling Style
3 Cooling Dome
4 Pipe
5 Oils Grant Equipment
6 Focusing Arrangement
7 Eight Taking over roller
9 Take-up Motion
10 Covering
Y Line of thread